

A COMPARATIVE STUDY OF ASPIRATION AND NON-ASPIRATION FINE NEEDLE TECHNIQUE IN PATIENTS WITH THYROID SWELLING AND ITS CORRELATION WITH POSTOPERATIVE HISTOPATHOLOGICAL EXAMINATION

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Abstract

Background: Thyroid lesions may present as diffuse enlargements, solitary nodules, or multiple nodules. The incidence of malignancy is relatively low among various nodular thyroid lesions. This study evaluated the efficacy of fine-needle non-aspiration cytology (FNNAC) compared with fine-needle aspiration cytology (FNAC) of thyroid lesions regarding cellular and haemorrhagic yields. **Material and Methods:** This prospective and comparative study included 50 patients at the Department of General Surgery, Govt. Mohan Kumaramangalam Medical College and Hospital, Salem, between October 2019 and September 2021. A detailed history was obtained, and an examination was performed. Systemic examinations and basic investigations were also performed. Patients who underwent planned surgery and postoperative HPE report compared with FNAC and FNNAC. **Results:** Among the 50 patients with thyroid swelling studied FNNAC produced superior quality smears than FNAC, and the difference was statistically significant ($p < 0.05$). The total average score was then obtained by adding all the scores in FNAC & FNNAC and was found to be 5.8 and 6.5, respectively. On analysing the average scores, the average score obtained by FNNAC was more than FNAC (6.3 vs. 5.8). However, the diagnostic adequacy was the same for both techniques (96%), indicating no statistical difference. FNNAC showed better results than FNAC in postoperative histopathological examination. **Conclusion:** FNNAC is the preferred technique for highly vascular organs, such as the thyroid, as there is a better material with less admixture of blood. The number of superior-quality smears without admixture of blood was higher in FNNAC.

INTRODUCTION

The Thyroid gland is unique among the endocrine glands because of its large size and superficial location, which makes it easily accessible for direct physical, cytological, and histopathological examinations. In clinical practice, thyroid gland diseases are prevalent owing to developmental, inflammatory, infectious, hyperplastic, degenerative, and neoplastic pathologies. Thyroid lesions may present as diffuse enlargements or solitary or multiple nodules. The incidence of malignancy is relatively low among various nodular thyroid lesions. Hence, diagnostic modalities that can better differentiate between benign and malignant lesions and between non-neoplastic and neoplastic lesions are of prime importance, based on which further

treatment can be decided. The surgeon has depended on the histopathologist for over a century to provide a definitive diagnosis and to decide on further therapy. As the procedure was complex and the cost factor was high, it led to the utilisation of exfoliated cells as a screening and predictive tool. Later, pioneer cytologists began employing needles in tissues to obtain a rapid diagnosis.

Due to the ever-increasing demand for a minimally invasive, relatively painless, cheap, and rapid diagnostic modality, fine needle aspiration cytology has flourished and grown enormously. Its clinical value is not only limited to neoplastic conditions but also in establishing the diagnosis of inflammatory, infectious, and degenerative conditions for which samples can be used for biological and biochemical analyses. Thus, Fine needle aspiration cytology of

the thyroid has become the first-line diagnostic test for evaluating various thyroid disorders. In clinical practice, FNAC is mainly used to differentiate malignant thyroid nodules from benign nodules because the later can be followed up clinically. Fine-needle aspiration cytology involves the aspiration of cellular material from the target masses using high suction pressure with the help of a needle and syringe.

However, FNA has the disadvantage of inadequate and bloody samples because the thyroid is a highly vascular organ. A modified sampling technique called fine-needle non-aspiration cytology (FNNAC), pioneered in France by Brifford et al. in the 1980s, has recently become clinically used. In FNNAC, active aspiration using a syringe is replaced by capillary suction of fluid or semi-fluid material into a thin channel (fine needle). Therefore, the problem of fine, adequate, and bloody samples could be overcome. While superficial thyroid lesions are readily accessible with the blind FNAC technique, deeply seated lesions are relatively difficult to sample adequately for accurate diagnosis, for which imaging techniques such as ultrasound come into play. Hence, in our tertiary care centre, we utilized USG for deep seated lesions.

Aim

This study evaluated the efficacy of fine-needle non-aspiration cytology (FNNAC) compared with fine-needle aspiration cytology (FNAC) of thyroid lesions regarding cellular and haemorrhagic yields.

MATERIALS AND METHODS

This prospective and comparative study included 50 patients at the Department of General Surgery, Govt Mohan Kumaramangalam Medical College and Hospital, Salem, between October 2019 and September 2021. Ethical committee approval was obtained before the commencement of the study.

Inclusion Criteria

Patients with clinically palpable thyroid swelling and in the age group 18-70 years who were clinically diagnosed with thyroid swelling and consented to FNAC, FNNAC and surgery were included.

Exclusion Criteria

Patients with coagulopathy or bleeding diathesis, aged < 14 years, hypothyroidism, and thyrotoxicosis.

After a thorough clinical examination, all patients underwent FNAC and FNNAC. The fine-needle cytology technique was explained to the patient, and appropriate consent was obtained from each patient before the procedure. After subjecting the patients to FNNAC and FNAC using 23-gauge needles, the samples were smeared, air-dried, and sent to the pathologist, who performed cytological evaluation and reporting.

FNAC

A detailed explanation was given to the patient regarding the procedure, several pricks that would be needed, and possible complications, and written consent was obtained. The patient's swelling was palpated, and the skin was cleansed with alcohol. A 10 ml plastic syringe with a 23-gauge needle was inserted through the skin, and gentle suction was applied while the needle was moved vertically in the nodule. Suction was maintained for 5-10 passes, and fluid or aspirate appeared in the needle hub. After the material was observed in the needle's hub, the needle was removed from the swelling, and 5 ml of air was drawn into the syringe. The needle was re-attached to the syringe, a drop of aspirated material was placed on several glass slides and smears were prepared.

FNNAC

Fine-needle non-aspiration cytology was similar to FNAC, where the procedure was done without a suction. The needle was inserted into the swelling, and the aspirate flowed in to the needle through capillary action. The needle was then withdrawn and attached to a syringe with air inside. The material was then expelled onto glass slides using a plunger. The procedure was repeated, and the slides were prepared as FNACs. After the procedure, firm pressure was applied to the aspirated site with cotton, and the patient was observed for a few minutes before discharge.

USG guided FNAC/FNNAC

The patient underwent ultrasonography without local anaesthesia using a 7.5 MHz transducer and sterile gel. A 23 G needle was introduced into the lesion through the skin, allowing for continuous visualisation of the tip and shaft. The FNAC/FNNAC technique was performed when the needle reached the lesion. A single operator performed all needle sampling procedures, ensuring that bias was avoided throughout the process, from patient examination to slide smear preparation. No local anaesthesia was administered.

Staining Procedure

The slides were fixed in 85% isopropyl alcohol for 20-30 minutes and stained with Harris haematoxylin in the pathology department for 5-8 minutes. They were then washed, differentiated, blued, and dipped in 1% aqueous eosin. After drying, the samples were mounted on the DPX. Cytological diagnosis was made, and all slides were objectively analysed using a point-scoring system to compare FNAC, FNNAC, and USG-guided FNAC techniques. The slides were then dried and mounted on DPX.

Statistical Analysis

The results were interpreted statistically using the Z-test or Student's t-test.

RESULTS

Of the 50 cases studied, 14 were nodular colloid goitre, 13 were cystic colloid goitre, 20 were autoimmune thyroid, and three were malignant. [Table 1]

The analysis showed that more diagnostically superior samples were obtained using the FNNAC technique than with FNAC. Although FNAC has more diagnostically adequate samples than FNNAC, diagnostically unsuitable samples are equal in both FNAC and FNNAC. [Table 2]

Based on the comparison of smears obtained by FNAC and FNNAC, FNNAC produced a greater number of superior quality smears than FNAC, and the difference was statistically significant ($p < 0.05$). [Table 3]

Based on the average score for each parameter in FNAC and FNNAC of thyroid lesions, it was found

that the FNNAC score was numerically higher than that of FNAC. [Table 4]

The score obtained was added, and the average score for each parameter was tabulated using FNAC and FNNAC. The total average score was then obtained by adding all the scores in FNAC & FNNAC and was found to be 5.8 and 6.5, respectively. On analysing the average scores, the average score obtained by FNNAC was more than FNAC (6.3 vs. 5.8). However, diagnostic adequacy was the same for both techniques (96%), thus conferring no statistical difference. [Table 5]

Table 1: Demographic data of the study

		Number of cases
Sex	Male	7(9%)
	Female	43(91%)
Diagnosis	Nodular colloid goitre	14(28%)
	Cystic colloid goitre	13(26%)
	Autoimmune thyroiditis	20(40%)
	Follicular neoplasm	1(2%)
	Papillary carcinoma	1(2%)
	Medullary carcinoma	1(2%)

Table 2: Comparison of grading of smears between FNNAC and FNAC

Grading of smears	FNNAC	FNAC	P value
Diagnostically superior	36(72%)	22(44%)	<0.05
Diagnostically adequate	12(24%)	26(52%)	
Diagnostically unsuitable	2(4%)	2(4%)	

Table 3: Comparison of superior quality of smear between the groups

FNNAC	FNAC	Z score	P value
36	22	2	$P < 0.05$

Table 4: Average scores between the groups

	FNAC	FNNAC
Adequacy	1.72	1.84
Architecture	1.08	1.2
Cellular degeneration	1.04	0.96
Cellular trauma	1.04	1.08
Background of blood	1.08	1.64

Table 5: Total average score between the groups

Technique	Average score	Diagnostic adequacy	Number of superior quality smears
FNNAC	6.3	0.96	18(72%)
FNAC	5.8	0.96	11(44%)
P value	$P > 0.05$	$P > 0.05$	$P < 0.05$

DISCUSSION

Fine-needle sampling is a commonly employed technique for the diagnosis of thyroid lesions. Malignancy in the thyroid is less prevalent (3–5%) than in benign lesions. Arriving at a correct diagnosis by properly utilising FNC can help reduce the number of diagnostic thyroidectomies. The underlying principle of fine needle aspiration cytology (FNAC) involves the application of suction pressure to aspirate cellular material from target masses. An alternative fine-needle sampling technique called fine-needle non-aspiration cytology (FNNAC) was developed in France, in which tumour cells are obtained with a thinner needle using capillary action.

The present study compared the fine needle non-aspiration technique to blind FNAC and USG-guided FNAC to evaluate their efficacy. This study included samples from 50 patients with thyroid swelling obtained by blinded FNAC and FNNAC. Considering all the observations and results of each technique in the thyroid, it was found that the number of superior-quality smears was higher in the FNNAC technique (18 vs. 11), and this difference was statistically significant ($p < 0.05$). However, FNAC is the procedure of choice for cystic thyroid lesions such as cystic degeneration in nodular colloid goitre. It allows adequate drainage of fluid material and is therapeutic in cases of simple benign cysts. FNAC yielded adequate diagnostic material in these cases.

The results obtained in this study comparing the two techniques of FNC in thyroid swelling are in concordance with the results of previous studies conducted in the past. The observations and scores range correlated well with the following studies: Mair et al., Raghuvver et al. in 2012, Ali Rizvi et al. in 2005, and Tublin Mitchell et al. in 2007. There were no unsuitable smears, with USG-guided FNAC favouring its use for cystic lesions of the thyroid. On analysing the mean score under subcategories such as cellular adequacy, retention of architecture, degree of cellular trauma, and background blood, scores obtained by FNNAC were numerically higher than those obtained by FNAC. In particular, the amount of background blood in the FNNAC technique was very low, contributing to a higher average score.

CONCLUSION

For highly vascular organs, such as the thyroid, FNNAC is the preferred technique because there is better material with less admixture of blood. The number of superior-quality smears without admixture of blood was higher in FNNAC. Although equally diagnostic, FNAC smears mostly produce diagnostically adequate rather than superior quality.

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